

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended): A method for creating multi-layered metal interconnects, comprising:
 - providing a substrate, ~~with semiconductor devices having been created in or over the~~ substrate, and at least one point of electrical contact ~~having been provided over the~~ substrate;
 - creating a first layer of metal comprising at least one first level metal interconnect in a first direction having an ~~ending and a there with associated end surface~~;
 - defining a channel over the first layer of metal having a central axis perpendicularly intersecting with said first direction; ~~further having borders separated from said central axis by a distance~~, said central axis overlying said end surface; and
 - creating at least one additional layer of metal, comprising at least one metal interconnect not overlying said channel in a second direction, said second direction perpendicularly ~~intersecting with said first direction~~, said at least one additional layer of metal further comprising at least one via over said end surface of said at least one first level metal interconnect and making contact therewith.
2. (Canceled).
3. (Original): The method of claim 1, said at least one additional layer of metal further comprising at least one interconnect between said at least one first level metal interconnect and said at least one via.
4. (Currently Amended): The method of claim 1, wherein:
 - said first layer of metal comprising multiple first level metal interconnects in a first direction having ~~endings and there with associated end surfaces~~, said end surfaces of said multiple first level metal interconnects being ~~linearly positioned~~ along a line; and

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

said at least one additional layer of metal comprising overlying levels of interconnect metal, comprising metal interconnects not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction.

5. (Currently Amended): The method of claim 4, said overlying levels of interconnect metal further comprising multiple vias over said end surfaces of said multiple first level metal interconnects and making contact with a sub[[-]]set there[[-]]of.

6. (Original): The method of claim 4, said overlying levels of interconnect metal further comprising interconnects between said multiple first level metal interconnects and said multiple vias.

7. (Original): The method of claim 4, wherein said metal interconnects not overlying said channel are stacked and parallel.

8. (Currently Amended): The method of claim 1, wherein:

said first layer of metal comprising multiple first level metal interconnects in a first direction ~~having~~ has endings and there[[-]]with associated end surfaces, said end surfaces of said multiple first level metal interconnects being ~~linearly positioned along at least one line;~~ and

said additional levels of interconnect metal ~~comprising~~ comprise metal interconnects not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction, metal interconnects of additional levels of interconnect metal being stacked and parallel.

9. (Currently Amended): The method of claim 8, said additional levels of interconnect metal further comprising at least one joining interconnect between metal of a level of interconnect and a surface ~~area~~ of said level of interconnect that is located over an end surface of said first layer of metal.

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

10. (Currently Amended): The method of claim 8, wherein said additional levels of interconnect metal further ~~comprising~~ comprise at least one via connecting said joining interconnect with said end surface of said first level metal interconnects.

11. (Currently Amended): A method for creating multi-layered conductive interconnects, comprising:

providing a substrate, with semiconductor devices in or over the substrate, and at least one point of electrical contact over the substrate;

~~The method of claim 1, wherein:~~

~~said creating~~ a first layer of conductive material comprising at least one first level conductive interconnect in a first direction having an ~~ending and a there-with associated end surface;~~ and

defining a channel over the first layer of conductive material having a central axis perpendicularly intersecting with said first direction; , said central axis overlying said end surface; and

~~said creating~~ at least one additional layer comprising at least one overlying layer of conductive material, comprising at least one overlying conductive interconnect not overlying said channel in a second direction, said second direction perpendicularly ~~intersecting~~ with said first direction, said at least one additional layer of conductive material further comprising at least one via over said end surface of said at least one first level conductive material interconnect and making contact therewith.

12. (Currently Amended): The method of claim 11, wherein said at least one overlying layer of conductive material further ~~comprising~~ comprises at least one conductive via over said end surface area of said at least one first level metal interconnect and ~~making~~ makes contact there~~[-]]~~with.

13. (Currently Amended): The method of claim 11, wherein said at least one overlying layer of conductive material further ~~comprising~~ comprises at least one conductive interconnect between said at least one first level conductive interconnect and said at least one conductive via.

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

14. (Currently Amended): The method of claim 11, wherein:

~~said first layer of conductive material comprising multiple first level conductive interconnects in a first direction having an ending and there with associated end surfaces, said end surfaces of said multiple first level conductive interconnects being linearly are positioned along a line; and~~

~~said at least one overlying levels of conductive interconnect[[s]] comprising comprises multiple conductive interconnects not overlying said channel in a said second direction, said second direction perpendicularly intersecting with said first direction.~~

15. (Currently Amended): The method of claim 14, wherein said overlying levels of conductive interconnects further ~~comprising comprise~~ multiple conductive vias over said end surface area of said multiple first level conductive interconnects and ~~making makes~~ contact with a sub[[-]]set there[[-]]of.

16. (Currently Amended): The method of claim 14, wherein said overlying levels of conductive interconnects further ~~comprising comprise~~ interconnects between said multiple first level conductive interconnects and said multiple conductive vias.

17. (Original): The method of claim 14, wherein said conductive interconnects not overlying said channel are stacked and parallel.

18. (Currently Amended): The method of claim 11, wherein:

~~said first layer of conductive material comprising comprises multiple first level conductive interconnects in a the first direction having endings and there with associated end surfaces, said end surfaces of said multiple first level conductive interconnects being linearly positioned along a line; and~~

~~said additional levels of conductive interconnects comprising comprise multiple conductive interconnects not overlying said channel in a said second direction, said second~~

Appl. No. 10/661,042
Amtd. dated August 10, 2005
Reply to Office action of June 29, 2005

~~direction perpendicularly intersecting with said first direction, said multiple~~ conductive interconnects of additional levels of conductive interconnects being stacked and parallel.

19. (Currently Amended): The method of claim 18, wherein said additional levels of conductive interconnects further ~~comprising~~ comprise at least one joining conductive interconnect between conductive material of a level of conductive interconnects and a surface area of said level of conductive interconnects that is located over an end surface of said first layer of conductive material.

20. (Currently Amended): The method of claim 18, wherein said additional levels of conductive interconnects further ~~comprising~~ comprise at least one conductive via connecting said joining conductive interconnect with said end surface of said first layer of conductive material.

21. (Currently Amended): A method for creating multi-layered metal interconnects, comprising:

providing a substrate, with semiconductor devices ~~having been created in or over the~~ substrate, and at least one point of electrical contact ~~having been provided over the~~ substrate; creating at least one layer of interconnect metal over the substrate, comprising:

(i) a first layer of metal comprising at least one first level metal interconnect in a first direction having an ~~ending and a there with associated~~ end surface;

(ii) a channel defined over the first layer of metal having a central axis ~~perpendicularly intersecting with said first direction further having borders separated from said central axis by a distance,~~ said central axis overlying said end surface; and

(iii) at least one additional layer of metal, comprising at least one metal interconnect not overlying said channel in a second direction, said second direction perpendicularly ~~intersecting with said first direction,~~ wherein said at least one additional layer of metal further comprises at least one via over said end surface of said at least one first level metal interconnect and makes contact therewith.

22. (Canceled).

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

23. (Currently Amended): The method of claim 21, wherein said at least one additional layer of metal further ~~comprising~~ comprises at least one interconnect between said at least one first level metal interconnect and said at least one via.

24. (Currently Amended): A method for creating multi-layered conductive interconnects, comprising:

providing a substrate, with semiconductor devices ~~having been created in~~ or over the substrate, and at least one point of electrical contact ~~having been provided over~~ the substrate;

creating at least one layer of conductive interconnects over the substrate, comprising:

(i) a first layer of conductive material ~~created~~ comprising at least one first level conductive interconnect in a first direction having an ~~ending and a there-with associated end~~ surface;

(ii) a channel defined over the first layer of metal having a central axis perpendicularly ~~intersecting~~ with said first direction further ~~having borders separated from said central axis by a distance~~, said central axis overlying said end surface;

(iii) at least one additional layer of conductive material, comprising at least one conductive interconnect not overlying said channel in a second direction, said second direction perpendicularly ~~intersecting~~ with said first direction, wherein said at least one additional layer of conductive material further comprises at least one conductive via over said end surface area of said at least one first level conductive interconnect and makes contact therewith.

25. (Canceled).

26. (Currently Amended): The method of claim 24, wherein said at least one additional layer of conductive material further ~~comprising~~ comprises at least one conductive interconnect between said at least one first level conductive interconnect and said at least one conductive via.

27. (Withdrawn): A structure of multi-layered metal interconnects, comprising:

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

a substrate, semiconductor devices having been created in or over the substrate, at least one point of electrical contact having been provided over the substrate;

a first layer of metal comprising at least one first level metal interconnect in a first direction having an ending and a there-with associated end surface;

a channel having been defined over the first layer of metal having a central axis perpendicularly intersecting with said first direction further having borders separated from said central axis by a distance, said central axis overlying said end surface;

at least one overlying layer of metal, comprising:

(i) at least one overlying metal interconnect not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction;

(ii) at least one via over said end surface area of said at least one first level metal interconnect and making contact there-with; and

(iii) at least one interconnect between said at least one first level metal interconnect and said at least one via.

28. (Withdrawn): A structure of multi-layered metal interconnects, comprising:

a substrate, semiconductor devices having been created in or over the substrate, at least one point of electrical contact having been provided over the substrate;

at least one layer of interconnect metal over the substrate, comprising:

(i) a first layer of metal created comprising at least one first level metal interconnect in a first direction having an ending and a there-with associated end surface;

(ii) a channel defined over the first layer of metal having a central axis perpendicularly intersecting with said first direction further having borders separated from said central axis by a distance, said central axis overlying said end surface;

(iii) at least one additional layer of metal, comprising:

(a) at least one metal interconnect not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction;

(b) at least one via over said end surface area of said at least one first level metal interconnect and making contact there-with; and

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

(c) at least one interconnect between said at least one first level metal interconnect and said at least one via.

29. (Withdrawn): A structure of multi-layered metal interconnects, comprising:
- a substrate, semiconductor devices having been created in or over the substrate, points of electrical contact having been provided over the substrate;
 - a first layer of metal comprising multiple first level metal interconnects in a first direction having an ending and there-with associated end surfaces, said end surfaces of said multiple first level metal interconnects being linearly positioned;
 - a channel having been defined over the first layer of metal having a central axis perpendicularly intersecting with said first direction further having borders separated from said central axis by a distance, said central axis overlying said end surface;
 - overlying levels of interconnect metal, comprising:
 - (i) metal interconnects not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction;
 - (ii) multiple vias over said end surface area of said multiple first level metal interconnects and making contact with a sub-set thereof; and
 - (iii) interconnects between said multiple first level metal interconnects and said multiple vias.

30. (Withdrawn): The structure of multi-layered metal interconnects of claim 29, wherein said metal interconnects not overlying said channel are stacked and parallel.

31. (Withdrawn): A structure of multi-layered metal interconnects, comprising:
- a substrate, semiconductor devices having been created in or over the substrate, points of electrical contact having been provided over the substrate;
 - a first layer of metal comprising multiple first level metal interconnects in a first direction having an ending and there-with associated end surfaces, said end surfaces of said multiple first level metal interconnects being linearly positioned;

Appl. No. 10/661,042
Amdt. dated August 10, 2005
Reply to Office action of June 29, 2005

a channel defined over the first layer of metal having a central axis perpendicularly intersecting with said first direction further having borders separated from said central axis by a distance, said central axis overlying said end surface; and

additional levels of interconnect metal, comprising:

(i) metal interconnects not overlying said channel in a second direction, said second direction perpendicularly intersecting with said first direction, metal interconnects of additional levels of interconnect metal being stacked and parallel;

(ii) at least one joining interconnect between metal of a level of interconnect and a surface area of said level of interconnect that is located over an end surface of said first layer of metal; and

(iii) at least one via connecting said joining interconnect with said end surface of said first layer of metal.

Claims 32-34. (Canceled).

35. (New): A method for forming multi-layered metal interconnects, comprising:

providing a substrate having semiconductor devices in or over the substrate and at least one point of electrical contact over the substrate;

forming a first layer of metal comprising at least one first level metal interconnect trace aligned in a first direction and having an end;

forming at least one additional layer of metal above the first layer of metal, the at least one additional layer having at least two metal interconnect traces aligned in a second direction perpendicular to the first direction,

the at least two metal interconnect traces defining a channel therebetween, the channel overlying the end of the first level metal interconnect, said at least one additional layer of metal further comprising at least one via over said end surface of said at least one first level metal interconnect and making contact therewith.